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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/533,550	11/17/2005	Andrew Graham	1432.116.101/P29858	6310

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EXAMINER	
LOPEZ ESQUERRA, ANDRES	
ART UNIT	**PAPER NUMBER**
2818	

MAIL DATE	DELIVERY MODE
11/01/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/533,550	GRAHAM ET AL.	
	Examiner	Art Unit	
	Andrés López-Esquerra	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 September 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *22-25 and 27-43* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *22-25 and 27-43* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Acknowledgement is made of Amendments filled September 19, 2007.

2. Acknowledgement is made of Cancel Claim 26.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "sub region of the via hole that does not have the nanostructure" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner,

the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

4. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 22 – 25, 27 – 28, and 30 – 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mancevski US 2001/0023986 (Mancevski) in view of Choi et al US 2002/0001905 (Choi).

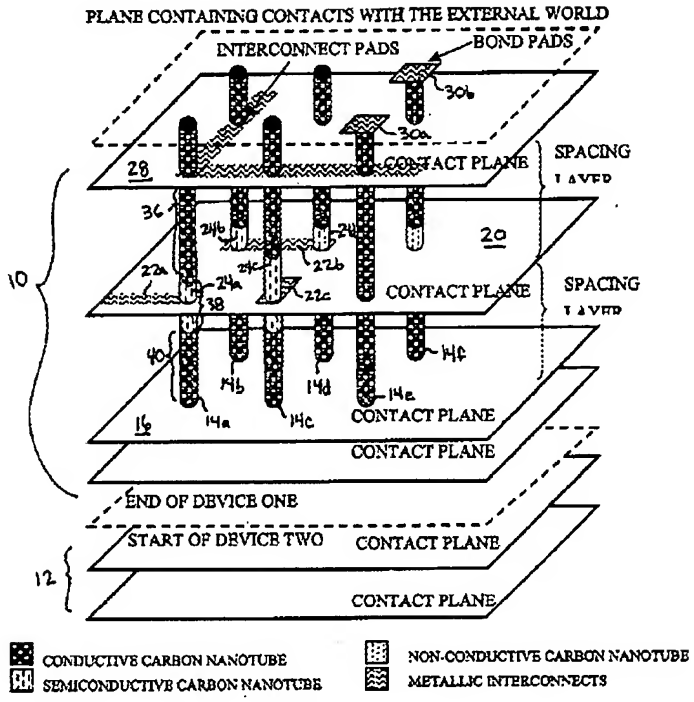


Figure 2

8. As for claims 22 and 41 – 43, Mancevski discloses (Page 3 [0040]) and shows in Fig. 2 a carbon nanotube transistor and method of manufacturing the same comprising:

a. a first electrically conductive layer (16);

b. a middle layer /spacing layers(10), formed partially from dielectric material, on the first electrically conductive layer;

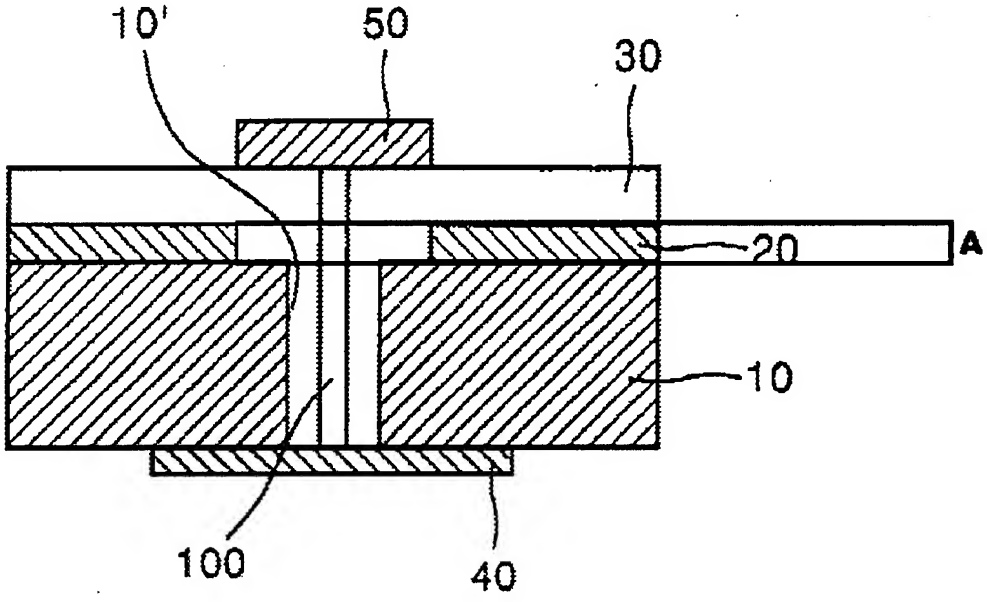
c. a second electrically conductive layer on the middle layer (28), and;

d. a nanostructure (14) integrated in a via hole/vertically aligned holes introduced into the middle layer, the nanostructure further comprising a first end portion that is coupled to the first electrically conductive layer and a second end portion that is coupled to the second electrically conductive layer (as shown in the Fig, 2 both ends of the nanotubes are imbedded in the contact layer);

e. wherein the middle layer, between two adjacent dielectric sublayers/spacing layers, has a third electrically conductive layer (20), the thickness of which is less than the thickness of at least one of the dielectric sublayers (as shown in Fig 2, the contact plane is thinner than the spacing layers).

9. Mancevski fails to disclose use of a ring structure formed from an electrically insulating material as gate-insulating region of the field-effect transistor is arranged in the third electrically conductive layer, which forms the gate electrode of the field-effect transistor, along the via hole that has been introduced therein.

FIG. 1



10. Choi discloses (Page 2, [0028]) and shows in Fig. 1 a FET transistor and method of manufacturing the same comprising a nanostructure (100) and the use of an insulation ring (A) in the are of the gate (20) of the transistor.

11. Choi is evidence that ordinary workers in the art would find a reason, suggestion or motivation to use a ring structure in the gate area made of an insulating material.

12. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Mancevski by using a ring structure in the gate area made of an insulating material for advantages such as achieving a high-density integration in the final structure of the FET (Page 2, [0028]).

13. Also, a recitation of "wherein the first end portion of the nanostructure forms a first source/drain region and the second end portion of the nanostructure forms a second source/drain region of the field-effect transistor" of the claimed invention does not result in a structural difference between the claimed invention and the prior art, thus claimed invention is only an art recognized suitability for an intended purpose, MPEP 2144.07.

14. Furthermore, as for claim 43, it is obvious in view of the device disclose in Mancevski in view of Choi and claimed by the applicant since the claims only provide or form the different structures in the device, all of which are obvious by Mancevski in view of Choi.

15. As for claim 23, Mancevski discloses (Page 3 [0041]) that the catalyst (54) is deposit in the inner walls of the hole that start at the contact plane on the bottom (applicant's limitation of catalyst material between the first conductive layer an the nanostructure).

16. As for claims 24 – 25, Mancevski shows in Fig. 2 that the third conductive layer/contact layer (20) surrounds the nanostructure in the middle of the transistor as well as it been thinner than both dielectric layer/spacing layers.

17. As for claim 27, Mancevski discloses the claimed invention except for the additional electrically conductive layer and ring structure in the structure. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to add the additional electrically conductive layer and ring structure in the structure, since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. St. Regis Paper Co. v. Bemis Co., 193 USPQ 8.

18. As for claim 28, Mancevski shows in Fig. 2 that creation of a second transistor (12) next to the original transistor (10).

19. As for claims 30 – 32, Mancevski discloses (Page 6 [0068]) that the structure is made out of doped silicon and metal films. Mancevski discloses the claimed invention except for the use of silicon dioxide, silicon nitride, or silicon dioxide doped with potassium ions for the dielectric material, the use of polysilicon, tantalum, titanium, niobium, or aluminum for the third and additional electrically conductive layer, and the use of tantalum, tantalum nitride, titanium, molybdenum, aluminum, titanium nitride, or ferromagnetic material as the first and second electrically conductive layer. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to use of silicon dioxide, silicon nitride, or silicon dioxide doped with potassium ions for the dielectric material, the use of polysilicon, tantalum, titanium, niobium, or

aluminum for the third and additional electrically conductive layer, and the use of tantalum, tantalum nitride, titanium, molybdenum, aluminum, titanium nitride, or ferromagnetic material as the first and second electrically conductive layer, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

20. As for claims 33 - 36, Mancevski discloses (Page 3 [0040], Page 8 [0092]) the nanostructure been a carbon nanotube and the catalyst been Fe, Ni, or Co.

21. As for claim 37, it is an obvious variation of creating the nanostructure and the catalyst needed for that type of material.

22. If applicants disagrees, a restriction requirement might be then in order.

23. As for claim 38, Mancevski discloses (Page 2 – 3 [0022]) the use of a insulating material where the nanostructure is present starting from where it is formed all the way through the hole (applicant's limitation of via hole been filled by an electrically insulating spacer.

24. As for claims 39 – 40, Mancevski discloses (Page 6 [0068]) that the structure is made out of doped silicon and metal films (applicant's limitation of the structure been dielectric material, metallic material, and the nanostructure and the limitation of made of polycrystalline or amorphous material.

25. Claim 29 rejected under 35 U.S.C. 103(a) as being unpatentable over Mancevski in view of Martin et al. US 2001/0019279 (Martin).

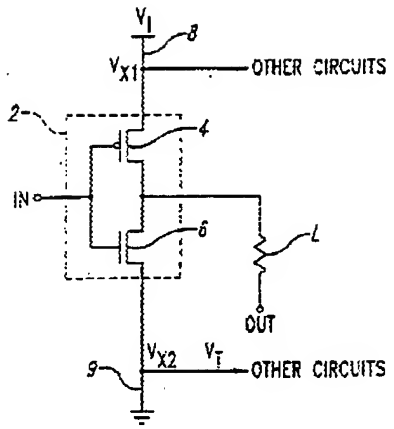


Fig. 1

26. As for claim 29, Mancevski discloses the claimed invention except for the use of the transistors as an inverter circuit. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to connect both transistors as a inverter circuit since it was known in the art that, as evidence in Martin, that the inviter circuit (2) takes the use of two transistors (4,6) connected as in Fig. 1 above. Furthermore, It would have been an obvious matter of design choice to connect both transistors as an inverter circuit, since applicant has not disclosed that this connection solves any stated problem or is for any particular purpose and it appears that the invention would perform equally well in any other circuit with the need of two transistors. Finally, a recitation of "as an inverter circuit" of the claimed invention does not result in a structural difference between the claimed invention and the prior art, thus claimed invention is only an art-recognized suitability for an intended purpose, MPEP 2144.07.

Response to Arguments

27. Applicant's arguments with respect to claims 22 – 25 and 26 – 43 have been considered but are moot in view of the new ground(s) of rejection.

28. As per applicant's argument (Page 9, lines 7 – 15):

> "The Examiner objected to the drawings under 37 C.F.R. 1.83(a). The drawings must show every feature of the invention specified in the claims. In particular, the Examiner has stated that the "sub region of the via hole that does not have the nanostructure" must be shown or the feature(s) cancelled from the claims(s)..."

29. examiner respectfully disagrees.

30. The amendment to claim 38 did not resolve the objection since the objection is that the figure does not show the limitation of "sub region of the via hole that does not have the nanostructure" the same is still not clearly present in the figure, therefore the objection is present.

31. As per applicant's argument (Page 10, line 2 - Page 13, line 4):

> "Applicant has amended claim 22 to include features from claim 26, which is now canceled. Amended claim 22 recites a vertically integrated field-effect transistor including, a first electrically conductive layer, a middle layer, formed partially from dielectric material, on the first electrically conductive layer, a second electrically conductive layer on the middle layer, and a nanostructure integrated in a via hole introduced into the middle layer. The nanostructure includes a first end portion that is coupled to the first electrically conductive layer and a second end portion that is coupled to the second electrically conductive layer..."

32. examiner respectfully disagrees.

33. Applicant's arguments with respect to claims 22, 41, 43 have been considered but are moot in view of the new ground(s) of rejection since the argument go to the amendments made to independent claims 22, 41 and 43, the same have been properly rejected in paragraph 8 of the present Office Action.

34. As per applicant's argument (Page 10, lines 24 – 26, Page 13, lines 4 – 14):

> *"Therefore, Applicants respectfully request reconsideration and withdrawal of the 35 U.S.C. § 102(b) rejection to claims 22-25, 33-36, and 38-43, and request allowance of these claims."*

> *"Claims 41 and 43, which have been amended in a similar manner, are allowable for the same reasons, as are dependant claim 23-25, 27-40, and 42. Thus, the subject- matter of claims 23-25 and 27-42 is believed to be non-obvious over Mancevski for at least the same reasons..."*

35. examiner respectfully disagrees.

36. Since applicant's only argument toward claims 22 – 25, 27 – 40, and 42 is that they depend on independent claims 22 and 41, and the same have been properly rejected in paragraph 8 of the present Office Action, it is examiner's understanding that applicant agrees with the proper rejections of claims 22 – 25, 27 – 40 and 42 and therefore they stand rejected.

Conclusion

37. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 5,362,972, US 4,903,089, US 5,308,778, US 5,286,674, and US 5,398,200.

38. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrés López-Esquerra whose telephone number is (571) 272-9753. The examiner can normally be reached on M - Th 6:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven H. Loke can be reached on (571) 272 - 1657. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Andrés López-Esquerra
Examiner
Art Unit 2818

ALE

DAVID VU
PRIMARY EXAMINER